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ABSTRACT

Results of an evaluation of a governance model for inservice science teacher education by a committee of five classroom teachers, three scientists, and a science teacher educator are summarized. The model was designed to guide the implementation and evaluation of the goals and activities of a National Science Foundation-sponsored Academic Year Institute for middle grade (grades 4-8) teachers who teach one or more classes of science. The model accounts for three major dimensions of the curriculum development process: (1) specification of learner objectives; (2) implementation of instructional and learner activities; and (3) formative and summative evaluation. Results of the Institute in terms of the three dimensions of curriculum development are presented. Recommendations are offered regarding the efficacy of governance for science teacher education at the pre-college level. A selected bibliography is appended. (Author/CS)

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GOVERNANCE: APPLICABILITY TO PRE-COLLEGE SCIENCE TEACHER EDUCATION

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Abstract

A governance model for pre-college science teacher education has been tested at a four year college by a committee of five classroom teachers, three scientists, and a science teacher educator. The committee is the governing body of a National Science Foundation-sponsored Academic Year Institute for middle grade teachers who teach one or more classes of science. The model accounts for three major dimensions of the curriculum development process:

1. Specification of learner objectives
2. Implementation of instructional and learner activities
3. Formative and summative evaluation

Results of the Institute in terms of the three dimensions of curriculum development are presented. Recommendations are offered with regards to the efficacy of governance for pre-college science teacher education.

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GOVERNANCE: APPLICABILITY TO PRE-COLLEGE SCIENCE TEACHER EDUCATION

John D. Flowers

Governance can be defined as a process whereby goals and activities of two or more parties are initiated, implemented and evaluated according to policies endorsed by the parties. Explication of the process in terms of observable behavior serves to clarify the several dimensions of the process and highlights their interdependance. Indeed, evaluation of a given governance model is greatly enhanced if dimensions of the process are operationally defined in the model.

The In-service Teacher Education Curriculum Model[1] contains three clearly defined dimensions; namely, developing curriculum ends, developing and implementing means, and evaluation. The value of the model can be assessed in terms of the contributions of each dimension to the attainment of major objectives of an in-service program for science teachers.

Dimensions of the In-service Teacher Education Curriculum Model

The In-service Teacher Education Curriculum Model was developed to guide the implementation and evaluation of the goals and activities of a science institute for middle grades (grades 4-8) teachers.[2] The purpose of the institute was to increase the science knowledge of teachers in earth, life, and physical science.

1 Flowers, J. Governance for in-service teacher education curriculum development: a model. The Journal of the Georgia Association of Teacher Educators, Spring 1980, 4(2), 21-25.

2 National Science Foundation Academic Year Institute For Middle Grade Teachers NSF Award Number SPI - 7901324

Developing curriculum ends. Figure 1 indicates that results from a needs assessment are examined by a governance committee. The in-service instructional staff then develops curriculum ends in terms of objectives and activities designed to meet the assessed needs. Objectives and activities developed by the staff are then submitted to the governance committee for approval. Committee recommendations for deletion, modification, or addition of objectives and activities are submitted for staff reaction and are then forwarded to the governance committee. Objectives and activities approved by the governance committee are forwarded to the staff for implementation.

Developing and implementing means. Activities developed by the instructional staff and implemented during the course of instruction are examined by the governance committee. Recommendations are made regarding the appropriateness of the activities. If the activities are considered inappropriate, the staff reconsiders the activities along with any suggestions made by the governance committee. New or modified activities and objectives are then resubmitted to the governance committee for approval.

Evaluating the in-service program. Figure 1 indicates that the nature of summative evaluation is decided upon during the earliest stage of the curriculum development process. All parties are involved with decisions regarding the nature of summative evaluation and its weight in evaluating participant progress.

The mechanism of formative evaluation allows the staff to determine effectiveness of the on-going program. It also helps to identify areas of need which were not identified during the initial needs assessment procedure. Feedback represented by broken lines in Figure 1 indicates the source and direction for formative evaluation. The model requires that any formative evaluation procedure be initiated by the governance committee and results be forwarded to the

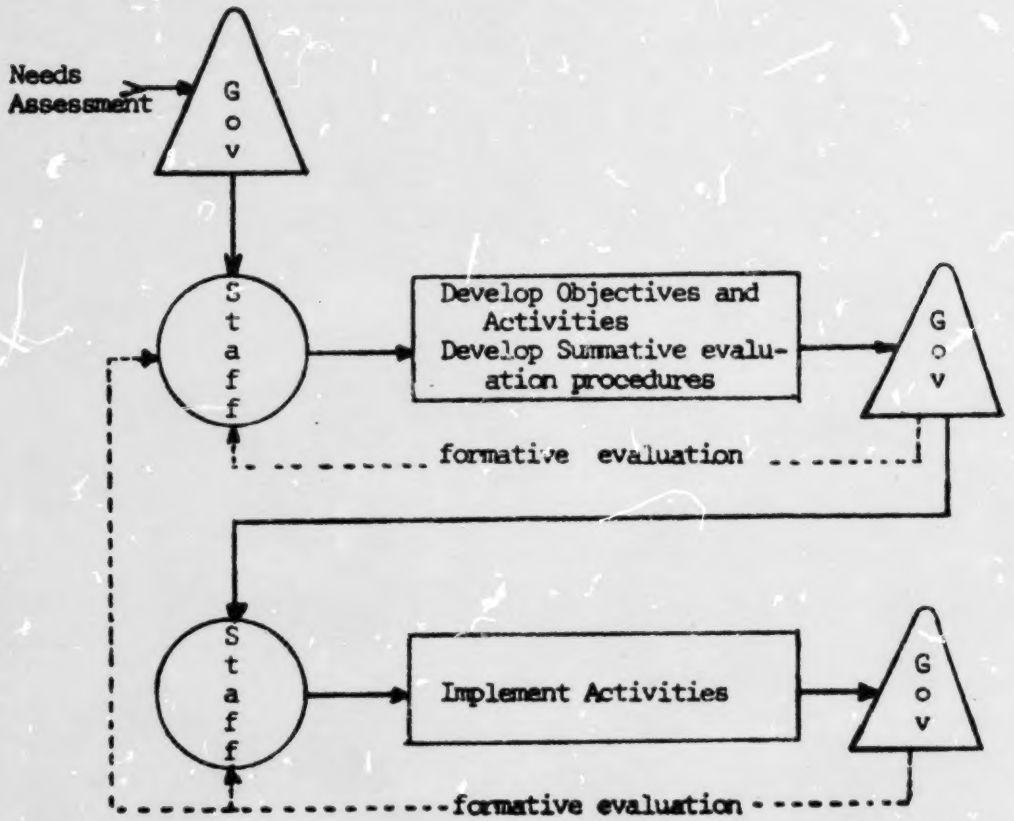

Figure 1

TASK FLOW CHART FOR GOVERNANCE COMMITTEE AND STAFF

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instructional staff. The model thus provides for formative and summative evaluation with input from instructional staff as well as the classroom teachers who are to receive the instruction.

The Governance Committee

It is useless to talk about governance without an understanding of the constituency and function of the committee responsible for the successful development and day-by-day activities of an in-service science teacher program. The structure and functions of a governance committee are based on at least three assumptions:

1. The process of curriculum development includes assessment of needs, specification of learner objectives, implementation of instructional and learner activities, and evaluation. Because in-service science programs are envisioned as curriculum development projects, generic components of the curriculum development process should be incorporated into the overall design of the committee and its tasks.

2. The value of learner and subject matter specialist input into curriculum development should be given high priority. The in-service program will be most effective in meeting teachers' needs if there is continuous input from teachers who are participating in the in-service program. There should, of course, be continuous input from the instructional staff.

3. Participant representatives and instructional staff can cooperatively formulate policies designed to produce and maintain a quality in-service science teacher program of study.

Committee sources. Various sources should be considered for possible inclusion. The prevailing rationale for broad input should result in the selection of persons from at least the following sources:

1. Classroom teachers--In order to assure participant representation, provision should be made to include at least as many participants as there are instructional staff. For example, if three college professors will be on the governance committee by virtue of the fact that they are instructional staff, then there should be at least three participants selected or elected to the committee.

2. Subject matter specialists--Persons who serve to carry out the instructional component of the in-service program should be

included on the governance committee.

3. Curriculum development specialist(s)--One or more science curriculum specialists from one or more school systems should be invited to serve on the governance committee.

4. Science teacher educator--A science teacher educator from a local college or university should be invited to serve on the governance committee.

Committee functions. The chairperson of the governance committee has the responsibility for calling committee meetings sufficient in number and length to accomplish three tasks related to the curriculum development process:

1. Evaluate needs assessment data. Develop instructional objectives sufficient for allotted in-service class time and appropriate to meet the expressed needs of the participants.

2. Utilize participant and staff feedback to modify the number of instructional objectives as well as the rate of implementing objectives and other instructional activities.

3. Develop instruments and procedures for evaluating participants, staff, and effectiveness of the program in meeting its stated objectives.

Members of the governance committee are charged with the responsibility of completing specific tasks regarding development of curriculum ends, implementation of instructional and learner activities, and evaluation. Tasks are clearly delineated to differentiate between staff and committee-as-a-whole responsibilities (See Figures 2-4).

An "interaction" component is also specified for each of three curriculum development processes. The nature of the interaction is such that both staff and participant representatives are compelled to poll their resources to solve problems encountered in the curriculum development process. For example, the interaction component regarding development of curriculum ends in Figure 2 requires that the collective effort of all committee members be focused on the task of determining the appropriateness of a concept or objective concerning science in the middle grades.

Figure 2

NSF-AYI Curriculum Development:
Tasks and Interaction

Ends: specification of middle grade concepts and objectives

Tasks for Project Staff

1. list all concepts
2. add or delete concepts as approved by Governance Committee
3. write one or more objectives for each concept (objectives will specify exactly what participants will know or be able to do following instruction)
4. delete objectives not approved by Governance Committee

Tasks for Governance Committee

1. approve/reject/modify concept lists for physical, earth, and life sciences
2. approve/reject/modify AYI objectives in content areas
3. add additional concepts
4. add additional objectives

Interaction

The Governance Committee will convene on a regular basis to accomplish curriculum development tasks. Decisions made regarding curriculum development should consider the major criterion of all curriculum tasks (viz., appropriateness of a concept or objective to one or more middle grades).

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Figure 3

NSF-AYI Program Implementation:
Tasks and Interaction

Means and Implementation: activities regarding instruction and participant application-of-knowledge*

Tasks for Project Staff

1. monitor participant application-of-knowledge activities
2. plan lectures, demonstrations, experiments, field trips, and other activities designed to enhance attainment of objectives

Tasks for Governance Committee

1. list activities that demonstrate participant application-of-knowledge
2. specify criteria for evaluating application-of-knowledge activities
3. specify application-of-knowledge deadlines
4. make suggestions for modifying instructional activities

Interaction

During Program Implementation the Project Staff will regularly seek Governance Committee suggestions regarding modification of instructional activities. Procedures for monitoring and implementing application-of-knowledge activities should be specified. The value of any and all Project activities should be regularly examined by the Governance Committee.

*Application-of-Knowledge: two projects developed by participants which demonstrate an on-the-job utilization of knowledge gained in the AYI

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Figure 4

NSF-AYI Evaluation:
Tasks and Interaction

Evaluation: formative and summative assessment of Project

Tasks for Project Staff

1. write two multiple choice objective-based items for each objective (knowledge or recall versus higher-than-knowledge)
2. develop a test schedule and grading procedure to be used with each group of participants

Tasks for Governance Committee

1. develop a grading procedure to be used for application-of-knowledge activities
2. make suggestions regarding evaluation of participants, staff, and project objectives

Interaction

Evaluation of the AYI will be in terms of attained objectives. All evaluation preocedures will be shared with participants during their first class meeting. Since a single grade will be awarded, the Governance Committee should resolve the problem of how course-work and application-of-knowledge activities will be reflected in a final grade.

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Problems and Recommendations

The model provided direction in carrying out all objectives of the NSF-funded science institute including development of ends and means, implementation, and evaluation. This is not to imply that implementation of the governance model was without its problems. There were a number of problems, some of which should be of interest to program developers and staff development coordinators. Hopefully, the recommendations accompanying each problem will help others to avert similar difficulties in future in-service programs utilizing a governance model.

Figure 5

Problems	Recommendations
Means & Ends	
excessive number of concepts and objectives	Set criteria for number of concepts and objectives to be taught in allotted time.
instructional staff not familiar with curriculum development process	Employ personnel who have demonstrated knowledge of curriculum development AND science content appropriate for given grade level(s).
	Provide training for personnel who are otherwise qualified to provide services.
instructional staff unwilling to delete objectives, concepts, and/or activities in face of cogent rationale presented by participants	Employ personnel who have "track records" working with classroom teachers and have shown a commitment to meet their needs.
content selected by instructional staff inappropriate for grade level(s) and/or expressed needs of participants	Provide for checkpoints in timeline when governance committee can review content selection.

Figure 5 continued

Problems	Recommendations
Implementation	
participants not clear about what they are to learn	Point out behavioral objectives in syllabus and write them on board.
	Use class time to explain expectations and discuss participant concerns--consider affective aspects as well as cognitive concerns.
content not appropriate for grade level(s)	Justify the appropriateness of selected content or call on a member of the governance committee who can do so.
	Bring participant concerns to the attention of the governance committee.
too much content during a single class session	Increase number of sessions OR delete material and/or activities.
individual class periods too long (4:00 - 7:50 with break)	Schedule shorter class sessions and increase number of meeting dates OR delete low priority objectives.
little or no review time for material previously covered in class	Prior to project implementation, determine an approximate percentage of class time that will be used for review.
Evaluation	
infrequent opportunity to evaluate quality of instruction	Develop instrument(s) to be used to assess quality of instruction.
high failure rate	Prior to project implementation, agree to use results of item analysis to remove poor items.

Figure 5 continued

Problems	Recommendations
	Instructional staff should agree to provide remedial activities designed to help participants achieve stated objectives.
	Plan to have mean scores reported to project director and/or governance committee chairperson.
Weighting of tests and projects favors pencil-paper tests	Consider weighting "application-of-knowledge" projects higher than ten percent--especially if intent of in-service is to get teachers more deeply involved with science and children.

Two additional recommendations are offered with regards to the governance committee. The first recommendation is that the value of the chairperson should be anticipated upon his/her experience in developing science curriculum, a commitment to the governance concept, and knowledge of the appropriateness of science content for specific grade levels. The simple fact that someone has had some administrative experience should not be the sole criterion for chairperson. Efficient administration is important in getting tasks completed on time: leadership is essential if the tasks are completed in the spirit of governance.

A second recommendation regarding the governance committee is that all parties be represented at every single governance meeting. The active participation of science curriculum specialists from various school systems is essential. Without the participation of the public school science curriculum specialist or general curriculum specialist, it is likely that less than an optimum number of teacher

needs will be met by the in-service program.

The In-service Teacher Education Curriculum Model may appear to have caused problems. The fact is that the problems would have probably been much worse and probably greater in number if there had been no model at all.

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*The governance model presented in this document is a synthesis of major dimensions of curriculum development and selected components of management processes associated with teachers' centers. This brief suggested bibliography should heop staff development or in-service coordinators gain insight into the mechanics of governance as it applies to in-service teacher training in which teachers control, to varying degrees, the curriculum development process.